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(54) Shift lever assembly.

(57) A shift lever assembly (2) includes a mechanism for adjusting the gap (9) between a rigid, spherical boot (7) and the periphery of an opening (5) in a console trim plate (6) through which a shift lever of a vehicle shifting mechanism extends. The mechanism preferably provides both radial adjustment for providing a uniform gap and also allows for the assembly to be easily adjusted up or down with respect to the opening in the console trim plate. Preferably, a threaded nut (10) is provided which threadably engages the shift lever and includes a flange (11) containing a series of positioning openings (14a-14c) which are engaged in a circle which is eccentric to the axis of the lever. The boot (7) preferably includes an opening (31), which is eccentric to its body, through which the lever extends. The boot includes a pair of ribs (32a, 32b) which, on station of the boot to an appropriate angle about the lever, engage two of the positioning openings (14a-14c) to lock the boot in an adjustment position.

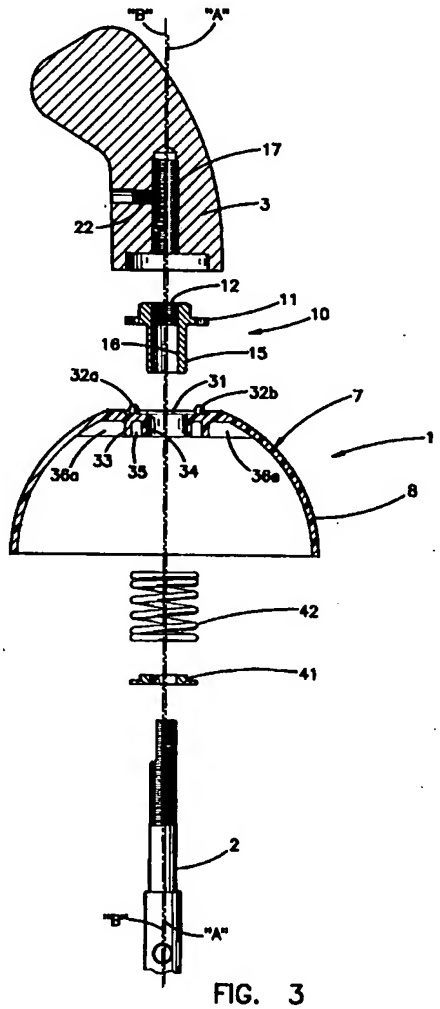


FIG. 3

EP 0 647 801 A1

This invention relates to a shifting mechanism, particularly for automotive vehicles, such as one in which the shift lever extends through an opening having a circular periphery and a rigid boot is connected to the lever for covering the opening. This invention also relates to a shift lever assembly for such a mechanism and to means for adjusting a gap between the exterior face of the boot and the periphery of the opening.

Vehicle shifters have been developed wherein the shift lever extends through an opening in the console trim plate, the opening permitting a three axis pivoting of the shifter. In other words, the shifter lever is shifted not only forwardly and rearwardly, but also sideways to the right and left. To permit such shifting action, it has been proposed that the opening be made circular with a rigid semi-spherical boot attached to the shift lever so as to substantially and continuously cover the circular opening regardless of whether the shift lever is shifted forwardly, rearwardly or sideways. However, this has created some problems due to various tolerances in the building of the shifter, the console, and various other components. That is, it has not been possible to center the circular opening of the console trim plate with the semi-spherical shifter boot. The result has been a differing gap along the entire periphery of the circular opening. From an aesthetic viewpoint, such differences in the gap are unacceptable and thereby rendering the use of a shifting mechanism having a shift lever with a rigid boot unmarketable.

The present invention aims to alleviate these problems.

According to a first aspect of the present invention, there is provided a shift lever assembly for a shifting mechanism having an elongated shift lever with one end extending along a longitudinal access through a first opening to a pivot point, the first opening having a periphery, the shift lever assembly being as claimed in claim 1.

Preferably, the periphery of the first opening is circular. The first opening is preferably in a console trim plate of a vehicle.

Preferably, the first means comprises nut means adapted for connection to the shift lever and adapted for movement therewith.

According to a second aspect of the present invention there is provided a shifting mechanism including a shift lever assembly according to the first aspect of the invention.

According to a third aspect of the present invention there is provided a shifting mechanism with the features of claim 13. Preferably, the second opening which is in the boot is circular.

According to a further aspect of the present invention there is provided a shifting mechanism with the features of claim 18.

A preferred construction provides for adjustment of the space or gap created between the spherical boot and the console trim plate by connecting to the shift lever a plurality of first positioning means and to the boot a plurality of second positioning means for cooperatively engaging the plurality of the first engaging means, one of these first or second positioning means being adjustable to selectively engage different ones of the other first or second positioning means whereby the gap between the face of the boot and the periphery of the opening can be adjusted.

In another preferred construction which may optionally include any of the features of the preceding preferred construction, the semi-spherical rigid boot is provided with an opening for receiving the elongated shift lever. This boot opening is preferably slightly offset from the centerline of the semi-spherical boot. A flange is preferably connected to the elongated shift lever and on this flange are provided a plurality of positioning means located on a circle, the center radius of which is offset from the longitudinal axis of the shift lever and the centerline of the semi-spherical rigid boot. Second positioning means is located on the boot for engaging the first positioning means. This second positioning means is also preferably located on a circle, the center of radius coinciding with the center radius of the circle on which the first positioning means are located. As a result of this arrangement, the eccentric rotation of the rigid boot, that is, about an axis offset from the centerline of the semi-spherical boot, adjusts the gap between the periphery of the circular opening and the face of the rigid spherical boot.

In a preferred embodiment, the first positioning means comprises an eccentric nut threadedly mounted on the elongated shift lever about the longitudinal axis of the lever. The nut preferably has a flange with a plurality of recesses, preferably openings, spacedly located on a circle about an axis located above or below and to one side of the centerline of the spherical boot which preferably coincides with the longitudinal axis of the shift lever. Extending below the flange there is preferably a cylindrical protrusion, the center radius of such protrusion preferably also being offset from the longitudinal axis of the shift lever so as to coincide with the center radius of the circle on which the recesses are located. The rigid boot is preferably rotatably mounted on this eccentric protrusion. A biasing means is preferably provided for forcing the boot upwardly into engagement with the flange so that the second positioning means of the boot, which are preferably nibs, engage in recesses of the flange. The adjustment may be made by forcing the boot downwardly against biasing means and rotating it. The boot may be indexed around the eccentric protrusion of the nut, so that a desired uniform gap between the circular opening in the console trim plate and the face of the rigid boot is observed. As soon as a uniform gap is obtained, a release of the boot preferably causes

the nibs of the boot to engage the recesses and hold the boot in that position.

Preferably, vertical adjustment of the rigid boot with respect to the opening, preferably circular, in the console trim plate can be made to adjust the nut and the rigid boot up and down on the lever, such as by providing the nut with a threaded inner surface for engagement with a threaded portion of the lever.

In yet another preferred construction, a shift lever assembly includes a mechanism for adjusting the space or gap between a rigid spherical boot and the periphery of an opening in console trim plate through which a shift lever of a vehicle shifting mechanism extends. The adjustment mechanism preferably provides both radial adjustment for providing a uniform gap and also allows for the assembly to be easily adjusted up or down with respect to the opening in the console trim plate. Preferably, a threaded nut is provided which threadably engages the shift lever and includes a flange containing a series of positioning openings which are arranged in a circle which is eccentric to the axis of the lever. The boot preferably includes an opening, which is eccentric to its body, through which the lever extends. The boot preferably includes a pair of nibs which, on rotation of the boot to an appropriate angle about the lever, engage two of the positioning openings to lock the boot in an adjusted position.

Thus, preferred embodinents allow, desirably, for adjustment of the gap between a spherical rigid boot and the opening in a console trim plate.

The present invention may be carried out in various ways and an embodiment of a shift lever assembly for a shifting mechanism in accordance with the invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a part-sectional side-elevational view of a shift lever assembly incorporated in a shifting mechanism in accordance with a preferred embodiment of the invention;

Fig. 2 is a view of the shift lever of Fig. 1 looking in the direction from the right side;

Fig. 3 is an exploded view of the various parts of the shifting mechanism;

Fig. 4 is an enlarged, side-elevational, cross-sectional view of an eccentric nut of the shift lever assembly;

Fig. 5 is a bottom view of the eccentric nut of Fig. 4;

Fig. 6 is an enlarged, top view of a rigid boot of the assembly, the enlargement being less than that of Figs. 4 and 5;

Fig. 7 is a side-elevational, cross-sectional view taken along the plane VII-VII of Fig. 6;

Fig. 8 is a side-elevational, cross-sectional view of the assembled parts of Fig. 3; and

Figs. 9A, 9B, and 9C are schematic views showing three adjusted positions of the rigid boot within an opening of a console trim plate.

Referring to Fig. 1, reference numeral 1 designates a shift lever assembly for a shifting mechanism 1,50 including a shift lever 2 having a handle 3 at one end thereof and a shift lever 4 extending downwardly therefrom for actuating a mechanism 50 about three axes (not shown). The mechanism 50 can be any well-known multiple axis shifter mechanism which is responsive to the fore and aft movement as represented by the arrows X and/or sideways movement as represented by the arrows Y (Fig. 2). For example, such mechanism could be the mechanism as described in U.S. Patent Re. 31,451. The shift lever 4 extends through an opening or periphery 5 of a console trim plate 6, which as shown is a part of a dashboard, although it could be a part of a center console between the driver and passenger seats. A rigid semi-spherical boot 7 is attached to the shift lever 4 to cover the opening 5. As discussed below, the shifter lever assembly allows for adjustment of a space or gap 9 (Fig. 1) between a face 8 of the rigid boot 7 and the periphery 5 of the console trim plate 6.

As Figs, 3 and 8 show, the shift assembly 1 includes the handle 3, an eccentric nut 10, the rigid boot 7, and a biasing spring 40, which is held in place by a collar 41. All of these parts or components are secured to the shift lever 2.

As disclosed in Fig. 8, the collar 41 rests on a shoulder 21 of the shift lever 2. The spring 40 is located on the collar 41 between the collar and the semi-spherical boot 7 above which is mounted the eccentric nut 10 which holds the spring 40 in compression causing spring 40 to force the boot 7 upwardly against a flange 11 of the nut 10. The handle 3 includes a dead end threaded opening 17 which receives the top end of the shift lever 2. The handle 3 is screwed into the threaded end of the lever 2 and held in place on the top end of the shift lever 2 by a set screw 22.

Referring to Figs. 4 and 5, which show the eccentric nut 10, it will be noted that the nut 10 is elongated and includes a tapped or threaded portion 12 having a central axis "B". The tapped portion 12 threadedly receives the upper end of the shift lever 2 (Fig. 8) which has a central longitudinal axis "B" concentric with the longitudinal axis "B" of the tapped or threaded portion 12. The nut 10 has a top hexagonal end 13 (Figs. 4 and 8A-8E) for rotating and screwing the nut on to the end of the shift lever 2. The nut flange 11 has a plurality of spaced openings or recesses 14a-14l located on a circle 18 or, in other words, having a locus of their centers located on the circle 18. The center radius of the circle 18 is as disclosed on Fig. 5 at the point "A" which is offset 1 mm to the right and 1 mm upwardly from the central axis "B" of the tap opening 12 through which the longitudinal axis "B" of the shift lever 2 extends. As will be described herein-

after, the openings or recesses 14a-14l are provided to index the position of the rigid boot so as to adjust the same for providing a uniform gap between the periphery of the opening 5 and the face 8 of the boot 7.

The eccentric nut 10 includes a cylindrical protrusion 15 having a bore 16 continuing downwardly from the tapped or threaded section 12 of the nut. The cylindrical protrusion 15 has as its center of radius an axis "A" which extends through the radius center of the circle 18. Therefore, the protrusion 15 is eccentric to the bore 16 and threaded upper end 12.

Referring now to Figs. 6 and 7, it will be noted that the boot 7 is semi-spherical in shape, the sphere having the center "E" through which the centerline "B" extends which falls on the same axis as the longitudinal axis "B" of the shift lever 2 and the centerline of the eccentric nut 10. The rigid boot 7 has an opening 31 located slightly off the center of centerline "B", the same degree as the centerline "A" is offset from the centerline "B" extending through the center "E" of the sphere of the boot 7. The boot 7 has a cut off top and is provided with a cylindrical recess 33 for receiving the flange 11 of the eccentric nut 10 (Fig. 8). A pair of nibs or pins 32a and 32b extend upwardly from the recess 31. These nibs are located on the circle 34 which corresponds to the circle 18 of the nut 10 so as to be received into diametrically opposed openings or recesses 14a-14l. Extending downwardly from the cut off top, are the spaced cylindrical flanges 35a and 35b providing the groove 37 for receiving spring 40 which, as preferred, provided in the form of a coil spring 40 (Fig. 8). Strengthening ribs 36a-36f extend downwardly from the top of boot 7.

The method of assembly of the shift lever assembly should be evident from Fig. 8. In assembling the parts, the collar 41 is placed over the end of the shift lever 2 after which the spring 40 is placed over the shift lever 2 onto the collar 41. The rigid boot 7 is then placed over the spring 40 with the spring being received within the groove 37. The eccentric nut 10 is then screwed onto the end of shift lever 2 to compress the spring 40 sufficiently for the spring 40 to apply a pressure to cause the rigid boot to stay in contact with the eccentric nut with nibs 32a and 32b located each in one of a pair of diametrically opposite ones of the openings 14a-14l. The entire assembly is then connected to the mechanism 50 with the boot extending within the opening 5 of the console trim plate 6.

If the gap or space 9 between the periphery of the opening 5 and the face 8 of the boot 7 is uniform, no adjustment is necessary. However, due to various tolerances in the building of the shifter, console, and various other components, very rarely, without adjustment, does the spherical boot 7 end up in the center of the opening of the console trim and, as a result, unsightly variations in the gap 9 between the periphery of the opening 5 and the face of the boot 7 exist. One such unsightly gap is disclosed in Fig. 9A wherein at the top of the opening, there is a substantial gap and at the bottom there is a very thin gap which destroys the aesthetic effect of the entire assembly.

Fig. 9B shows one adjustment made by forcing the boot 7 downwardly against the bias of spring 40 and rotating the boot 7 until the nibs or pins 32a and 32b (shown as darkened elements) are engaged within the openings 14c and 14i, respectively. Although with this adjustment the bottom of the rigid boot is moved away from the periphery of the opening 5, it is not sufficient to provide a uniform gap around the entire periphery of the opening 5. It will be observed from a comparison of Figs. 9A and 9B that in moving the pins or nibs 32a and 32b to the positions where they are engaging openings or recesses 14c and 14i, respectively, although the gap at the bottom of the opening 5 is larger, the adjustment made in Fig. 9B is not adequate to provide a uniform gap around the entire periphery of the opening 5 and boot 7.

Referring to Fig. 9C, the rigid boot 7 has been rotated 180° from the position of Fig. 9A so that the nib or pin 32a is located in the opening or recess 14g and the nib or pin 32b is located in the recess 14a. In this position, the uniform spacing around the periphery of the rigid boot 7 and opening 6 is near perfect. It should be understood that each set of holes in the adjuster is designed to add an additional .5 mm of radial adjustment from the shift lever centerline. Therefore, the total adjustment is 2.414 mm (the original 1.0 plus 1.414 of radial travel). If additional adjustment is required, the original offset of 1 mm upwardly and to the right could be increased. Once the proper adjustment is made, the spring 40 underneath the boot 7 applies sufficient pressure to force nibs 32a and 32b into openings 14g and 14a, respectively, to thus cause boot 7 to stay in contact with the eccentric nut as the shifter lever is shifted fore and aft or sideways.

It should be also understood that the adjustment of the nut by turning the hex-shaped head 10 allows the entire assembly to be easily adjusted both radially and up or down.

Although I have disclosed the preferred embodiment of this invention, it should be evident that there are other embodiments that could be made without departing from the spirit of this invention. Accordingly, the scope of my invention should be limited only as set forth in the appended claims.

Claims

1. A shift lever assembly for a shifting mechanism having an elongated shift lever with one end extending along a longitudinal axis through an opening to a pivot point, the opening having a periphery, the assembly comprising a rigid semi-spherical boot (7) adapted for connection to a shift lever (2) and adapt-

ed for movement with said lever in a first opening (5) for substantially and continuously covering said first opening, characterised by adjustment means for adjusting a gap (9) between an exterior face (8) of said boot and a periphery of said first opening, the adjustment means comprising first means (10) connected to said lever and movable therewith, said first means having a plurality of first positioning means (14a - 14b); and second means (32a, 32b) on said boot having a plurality of second positioning means, at least one of said second positioning means being adapted to co-operatively engage at least one of said plurality of said first positioning means to establish the position of said face of said rigid boot in relationship to said periphery; one of said second positioning means and said first positioning means being adjustable to selectively engage different ones of said other of said first positioning means and said second positioning means whereby the gap between said face of said boot and the periphery of said first opening can be adjusted to substantially provide a uniform gap.

2. A shift lever assembly as claimed in claim 1 in which one of said plurality of first positioning means and said plurality of second positioning means comprises nibs (32am 32b) and the other said plurality of positioning means comprises recesses (14a-14c) for receiving said nibs.

3. A shift lever assembly as claimed in claim 2 in which the plurality of first positioning means comprises recesses (14a-14c) and the second positioning means comprise nibs (32a, 32b).

4. A shift lever assembly as claimed in claim 2 or claim 3 in which the recesses comprise openings (14a-14c) and the second positioning means includes two diametrically oppositely located nibs.

5. A shift lever assembly as claimed in claim 3 or claim 4 in which the recesses lie on a circular locus and the second positioning means includes two diametrically opposite nibs (32a, 32b) adapted for location on said circular locus.

6. A shift lever assembly as claimed in any one of claims 2 to 5 in which the nibs and recesses are adapted to lie on a locus comprising a circle having its centre of radius ("A") offset from the longitudinal axis of the lever and a centerline of the semi-spherical boot (7)

7. A shift lever assembly as claimed in any one of the preceding claims in which the first means include a flange (11) adapted to extend radially from said lever (2) with said plurality of first positioning means (14a-14c) located thereon; said boot (7) includes a second opening (31) adapted to receive said lever; and said second positioning means (32a, 32b) is located on said boot adjacent said second opening in a position to receive at least one of said first positioning means.

8. A shift lever assembly as claimed in any one of claims 1 to 6 in which the first means comprise a nut (10) adapted for location on said lever and having a radial flange (11) with said plurality of first positioning means located thereon; said semi-spherical boot includes a second opening (31) which is adapted to receive said lever with a centerline of said second opening (31) being offset from the centerline of the semi-spherical boot 7) and said longitudinal axis of said lever; and said second positioning means is located adjacent said second opening in a position to receive at least one of said first positioning means.

9. A shift lever assembly as claimed in any one of claims 1 to 5 in which said first means comprises a nut (10) adapted to be threaded on said lever about a longitudinal axis of said lever, said nut having a radially extending flange (11) with said first plurality of positioning means being adapted for location on a circle the centre of radius of which is offset from the longitudinal axis of said lever; said nut having a cylindrical protrusion (15) extending downwardly from said flange and having the same centre of radius as said circle, said semi-spherical boot having a second opening (31) for receiving said cylindrical protrusion, said boot opening having a center of radius offset from a centerline of said semi-spherical boot.

10. A shift lever assembly as claimed in any one of the preceding claims in which the adjustment means is adapted to adjust the boot on said lever in a direction along said longitudinal axis.

11. A shift lever assembly as claimed in claim 10 when dependent upon anyone of claims 1 to 6 in which the adjustment means comprises a nut threadedly adjustable longitudinally on said lever and having a radial flange (11) with said plurality of first positioning means located thereon; said boot includes a second opening (31) for receiving said lever; and said second positioning means (32a, 32b) is located on said boot adjacent said second opening in a position to receive at least one of said first positioning means.

12. A shift lever assembly as claimed in any one of the preceding claims which includes biasing means (40) for forcing said first positioning means and said second positioning means into engagement for holding said boot in an adjusted position.

13. A shifting mechanism comprising a shift lever (2) with one end extending through a first opening (5) and a rigid boot (7) connected to said lever and movable with said lever in said first opening for substantially and continuously covering said opening, the opening having a periphery; said boot comprising a portion of a hollow sphere having an exterior face (8); a second opening (31) in said boot having a center axis offset from a centerline of said portion of said sphere; said lever extending through said second opening providing a handle (3) at one end and an actuator (4) at the other end; a positioning member (10) secured to said lever, said member having a plurality of spaced recesses (14a-14c) located on a circle having its center of radius on said center axis of said sec-

ond circular opening offset from a longitudinal axis of said lever; said portion of said sphere having at least one nib (32a, 32b), each nib being spaced from the center axis of said second opening and located in a position to receive at least one of said recesses; and said longitudinal axis and said center axis being offset one from the other whereby rotatably adjusting one of said positioning member and sphere portion to different positions wherein different ones of said recesses are engaged by said nibs adjusts the spacing between said face of said rigid boot and the periphery of said first opening.

14 A shifting mechanism as claimed in claim 13 in which the positioning member is rotatably mounted on said lever and has a radial flange (11) with said recesses (14a-14c) being located on said flange.

15. A shifting mechanism as claimed in claim 13 or claim 14 in which an adjustment means (11) is provided for adjusting the positioning member and boot on said lever in a direction along said longitudinal axis.

16. A shifting mechanism as claimed in claim 13 or claim 14 or claim 15 in which said positioning member comprises a nut threadedly mounted on said lever.

17. A shifting mechanism as claimed in any one of claims 13 to 16 which includes biasing mens for forcing said boot upwardly to force said nibs into said recesses.

18. A shifting mechanism (1) comprising an elongate shift lever (2) and a rigid concave boot (7) located on the lever and adapted for movement therewith, the boot being adapted for location adjacent a periphery of an opening (5) for covering the opening, which is preferably in a vehicle trim plate (6), with a gap (9) between the boot and the periphery of the opening, characterised by adjustment means (10, 14a-14c, 32a, 32b) for adjusting the gap.

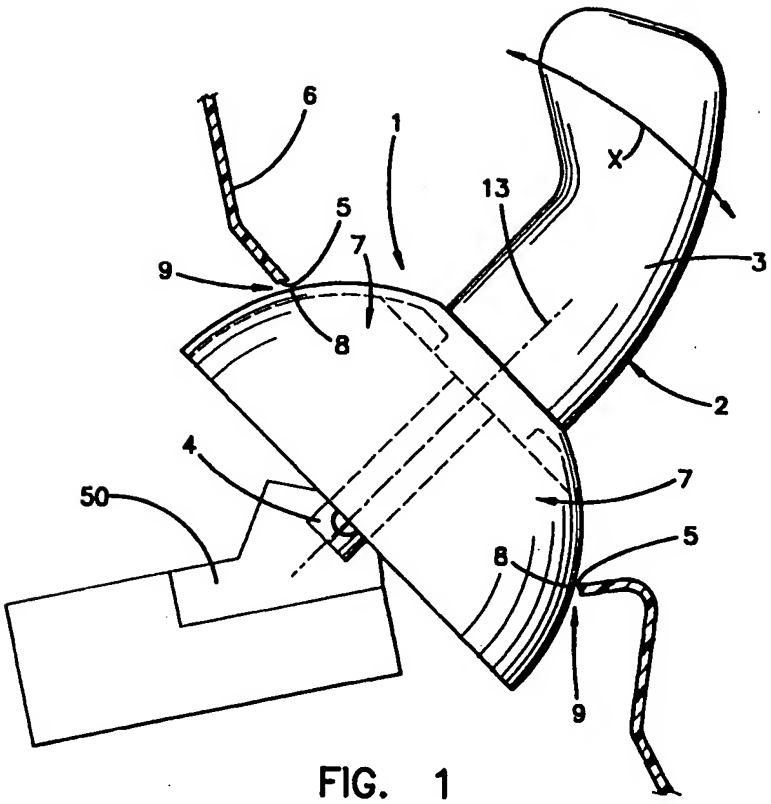


FIG. 1

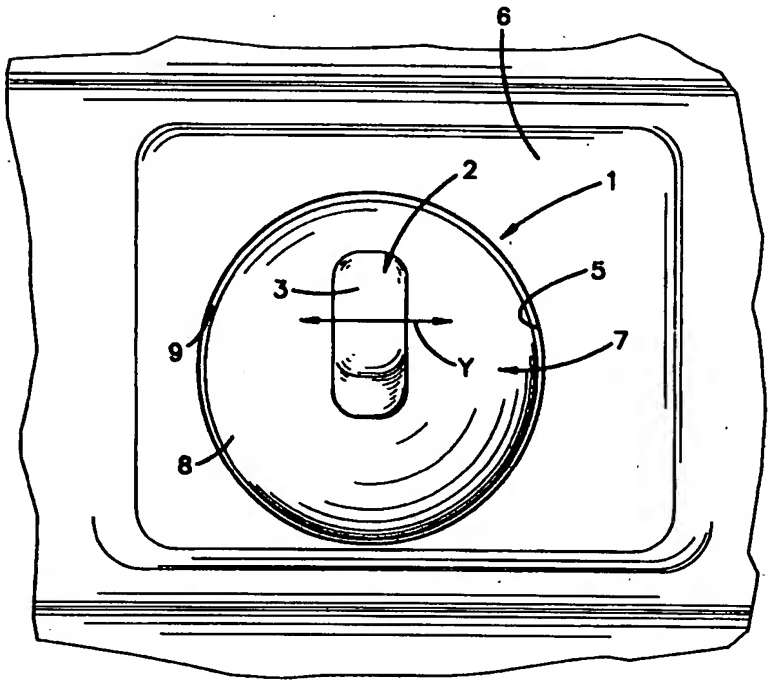


FIG. 2

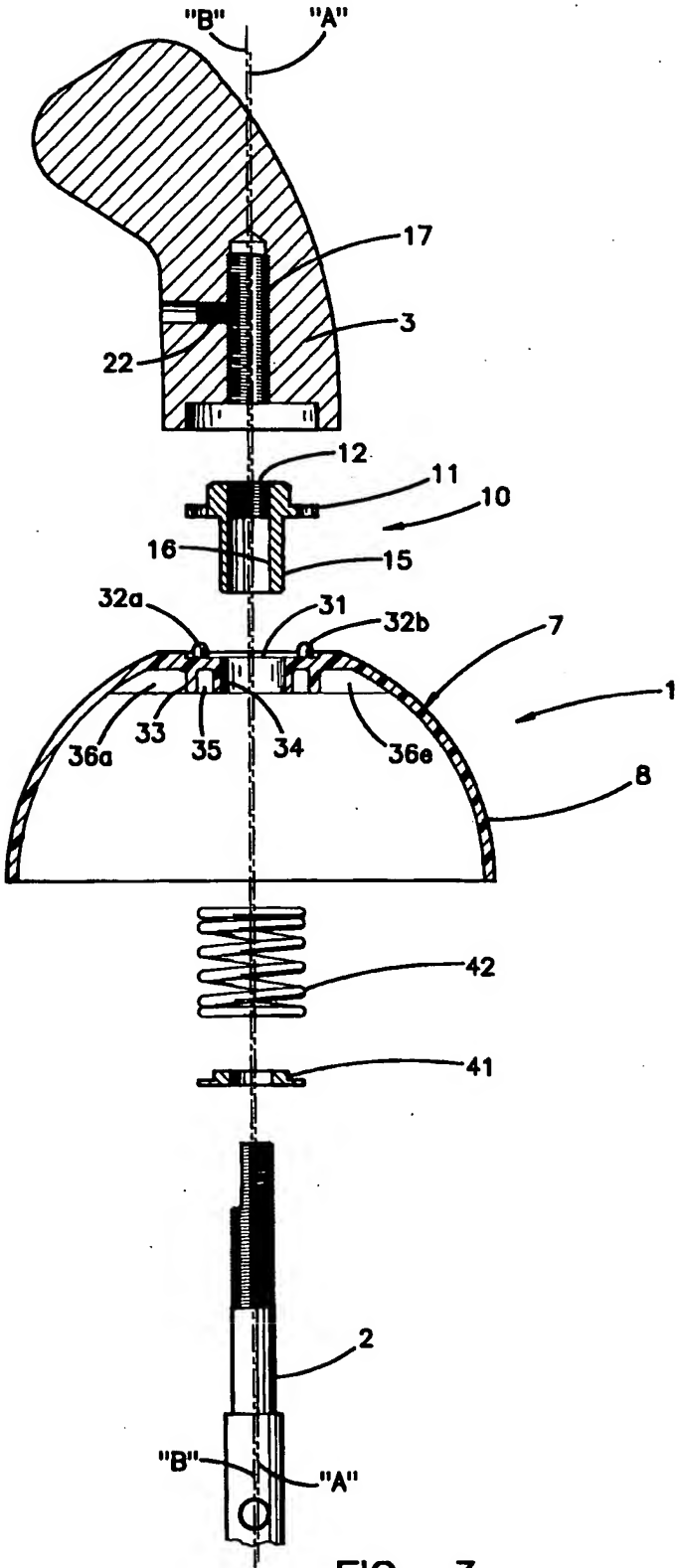


FIG. 3

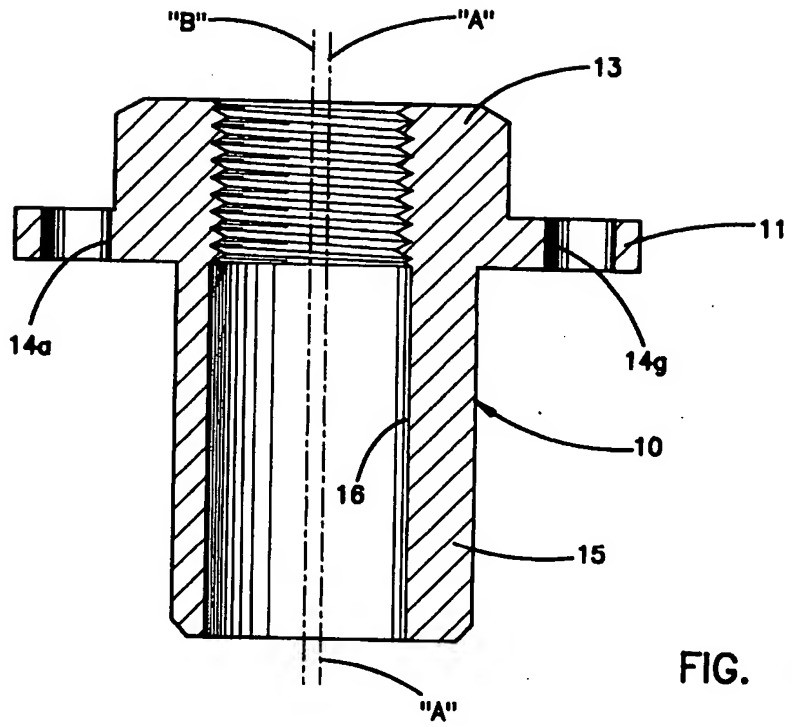

"B"
"A"
13
11
14a
14g
10
16
15
"A"

FIG. 4

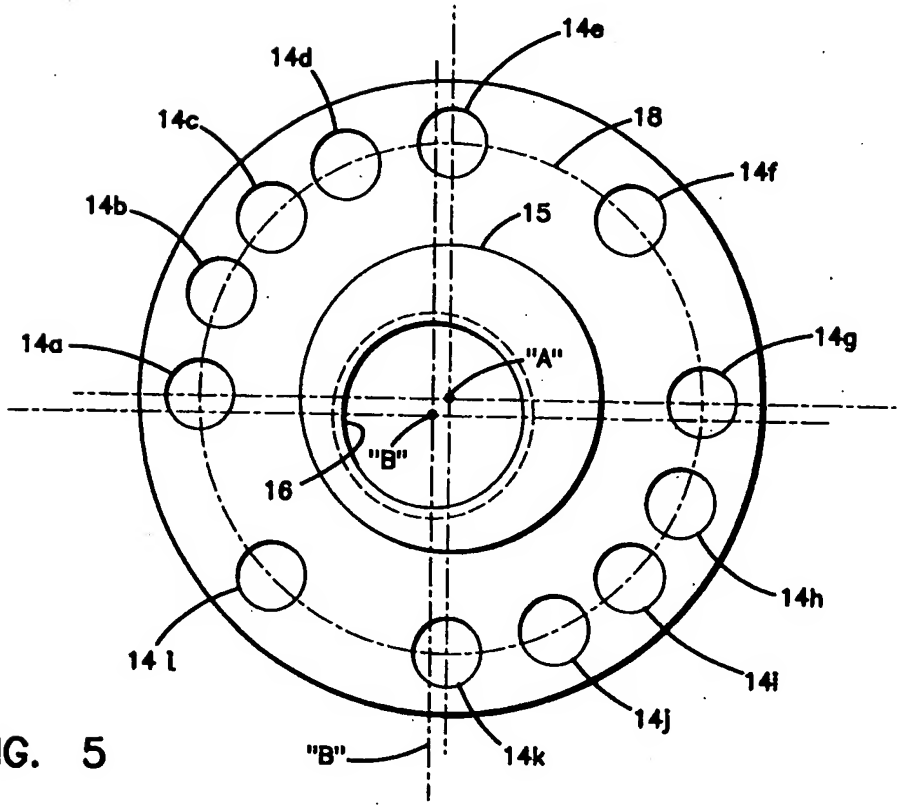
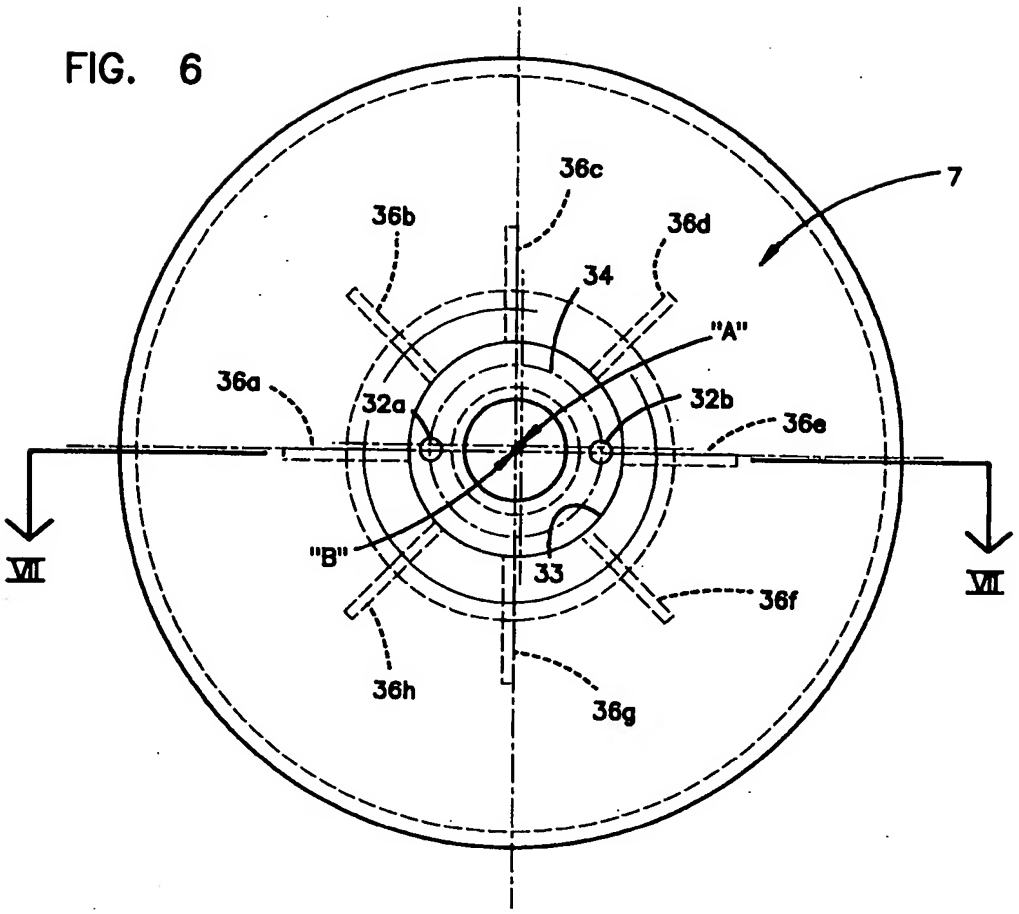

14e
14d
14c
18
14f
14b
15
14a
"A"
14g
"B"
16
14h
14 l
14i
14j
"B"
14k

FIG. 5

FIG. 6


36c
7
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36d
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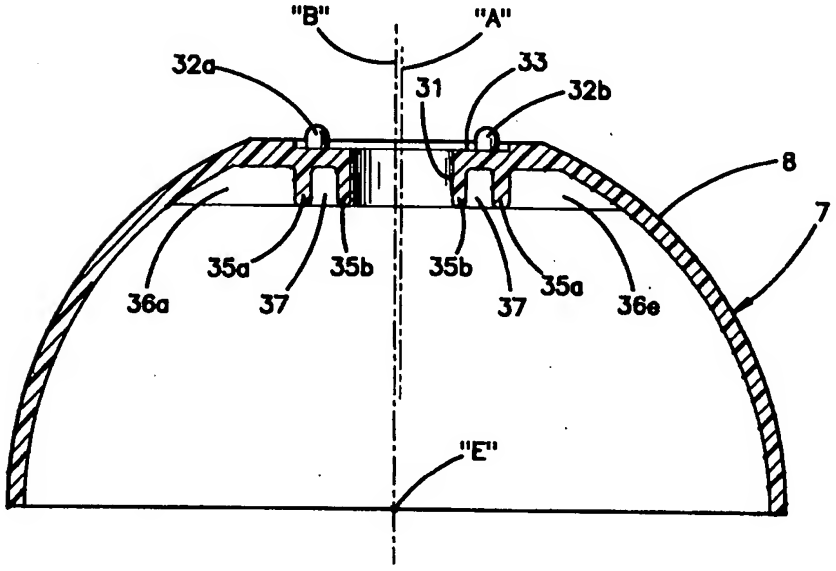
36a
32a
32b
36e
VII
VII
"B"
33
36f
36h
36g

FIG. 7


"B"
"A"
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35b
35b
35a
36a
37
37
36e
"E"

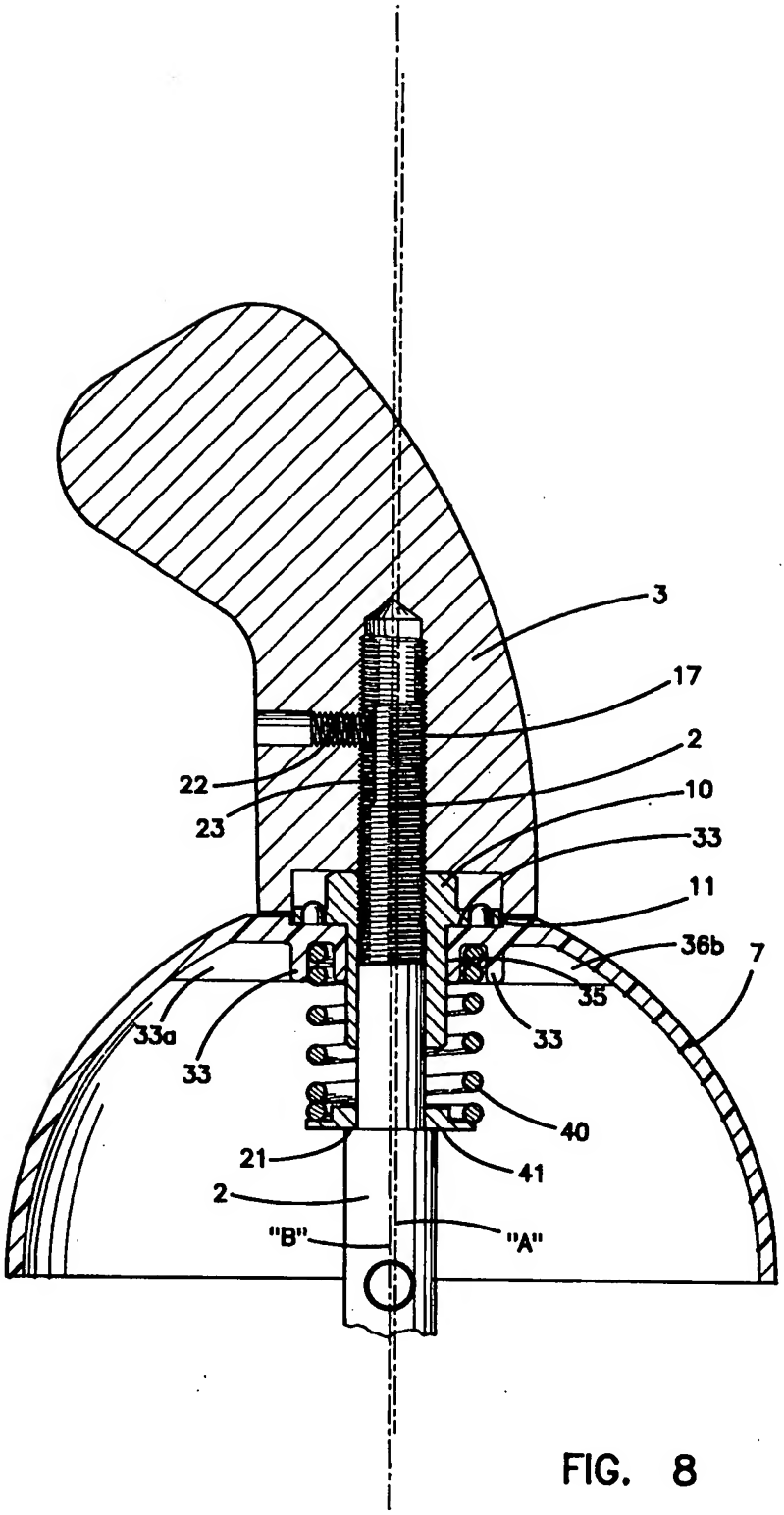

FIG. 8

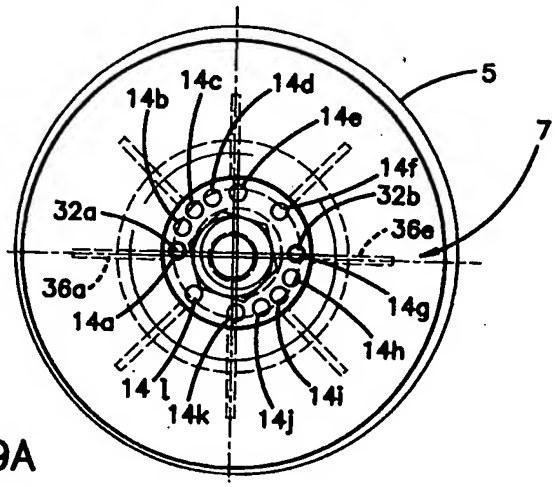

FIG. 9A

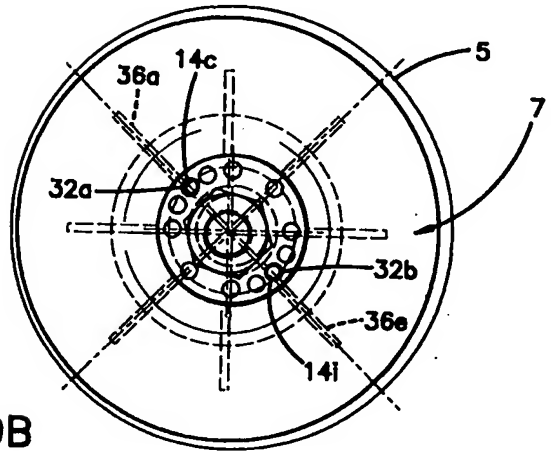

FIG. 9B

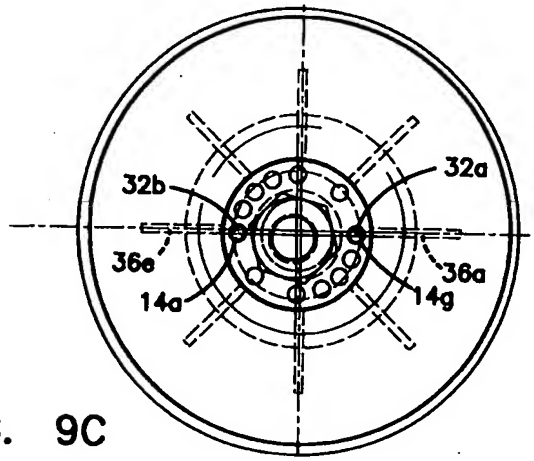

FIG. 9C

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 7415

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION
A	FR-A-2 272 315 (CATERPILLAR) * page 4 - page 5; figure 1 *	1	F16H59/02 B60K20/02 G05G25/04
A	GB-A-1 008 556 (FORD) * page 2; figure 10 *	1	
A	FR-A-1 504 022 (LA TÉLÉMÉCANIQUE) * page 3; figure 1 *	1	
D,A	US-E-RE31451 (OSBORN) * abstract; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F16H
G05G
B60K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 January 1995	Flores, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)